What is Claimed is:

1. A substrate for a perpendicular magnetic recording medium, comprising:

a nonmagnetic base composed of an aluminum alloy; and

a soft magnetic underlayer,

wherein the soft magnetic underlayer is composed of a Ni-P alloy containing phosphorus in a range of 0.5 wt% to 6 wt%.

2. The substrate according to claim 1, wherein the soft magnetic underlayer has a thickness of 3 μm or greater.

3. The substrate according to claim 1, further including a nonmagnetic underlayer composed of an Ni-P alloy formed between the base and the soft magnetic underlayer.

4. The substrate according to claim 3, wherein the nonmagnetic underlayer has a thickness ranging 0.5 μm to 7 μm, the soft magnetic underlayer has a thickness of 0.3 μm or greater, and a sum of the thickness of the nonmagnetic underlayer and the thickness of the soft magnetic underlayer is 3 μm or greater.

5. The substrate according to claim 3, wherein the nonmagnetic underlayer is composed of Ni-P alloy containing about 11 wt% of phosphorus.

6. The substrate according to claim 2, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.

7. The substrate according to claim 4, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.

8. A perpendicular magnetic recording medium comprising:

a substrate; and

a nonmagnetic seed layer, a magnetic recording layer, and a protective layer sequentially formed on the substrate,

wherein the substrate comprises a nonmagnetic base composed of an aluminum alloy; and a soft magnetic underlayer,

wherein the soft magnetic underlayer is composed of a Ni-P alloy containing phosphorus in a range of 0.5 wt% to 6 wt%, and

wherein the soft magnetic underlayer functions as a soft magnetic backing layer.

9. The perpendicular magnetic recording medium according to claim 8, wherein the soft magnetic underlayer has a thickness of 3 μm or greater.

10. The perpendicular magnetic recording medium according to claim 8, wherein the substrate further includes a nonmagnetic underlayer composed of an Ni-P alloy formed between the base and the soft magnetic underlayer.

11. The perpendicular magnetic recording medium according to claim 10, wherein the nonmagnetic underlayer has a thickness ranging 0.5 μm to 7 μm, the soft magnetic underlayer has a thickness of 0.3 μm or greater, and a sum of the thickness of the nonmagnetic underlayer and the thickness of the soft magnetic underlayer is 3 μm or greater.

12. The perpendicular magnetic recording medium according to claim 10, wherein the nonmagnetic underlayer is composed of Ni-P alloy containing about 11 wt% of phosphorus.

13. The perpendicular magnetic recording medium according to claim 9, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.

14. The perpendicular magnetic recording medium according to claim 11, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.

15. The perpendicular magnetic recording medium according to claim 8, further including a soft magnetic supplement layer between the soft magnetic underlayer of the substrate and the nonmagnetic seed layer, wherein the soft magnetic supplement layer has a film thickness of 50 nm or less, and a product of the film thickness and a saturation magnetic flux density is 150 G μm or larger.

16. A method of manufacturing the substrate for a perpendicular magnetic recording medium, comprising the steps of:

providing a nonmagnetic base composed of an aluminum alloy; and

electroless plating a soft magnetic underlayer composed of a Ni-P alloy containing phosphorus in a range of 0.5 wt% to 6 wt% on the nonmagnetic base.

17. The method according to claim 16, wherein the soft magnetic underlayer has a thickness of 3 μm or greater.

18. The method according to claim 16, further including the step of electroless plating a nonmagnetic underlayer composed of an Ni-P alloy on the base before electroless plating the soft magnetic underlayer.

19. The method according to claim 18, wherein the nonmagnetic underlayer has a thickness ranging 0.5 μm to 7 μm, the soft magnetic underlayer has a thickness of 0.3 μm or greater, and a sum of the thickness of the nonmagnetic underlayer and the thickness of the soft magnetic underlayer is 3 μm or greater.

20. The method according to claim 16, further comprising the step of heating the substrate to a temperature of 300° C or less for 30 minutes or longer after forming the soft magnetic underlayer.

21. The method according to claim 18, further comprising the step of heating the substrate to a temperature of 300° C or less for 30 minutes or longer after forming the soft magnetic underlayer.

22. The method according to claim 17, further including the step of polishing the surface of the soft magnetic underlayer using free abrasive grains to smooth the surface thereof.

23. The method according to claim 19, further including the step of polishing the surface of the soft magnetic underlayer using free abrasive grains to smooth the surface thereof.

24. The method according to claim 22, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.

25. The method according to claim 23, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.

26. A method of manufacturing a perpendicular magnetic recording medium comprising the steps of:

forming a substrate by providing a nonmagnetic base composed of an aluminum alloy, and electroless plating a soft magnetic underlayer composed of a Ni-P alloy containing phosphorus in a range of 0.5 wt% to 6 wt% on the nonmagnetic base;

texturing a surface of the soft magnetic underlayer using free abrasive grains; and

sequentially forming a nonmagnetic seed layer, a magnetic recording layer, and a protective layer by sputtering.

27. The method according to claim 26, wherein the soft magnetic underlayer has a thickness of 3 μm or greater.

28. The method according to claim 26, further including the step of electroless plating a nonmagnetic underlayer composed of an Ni-P alloy on the base before electroless plating the soft magnetic underlayer.

29. The method according to claim 28, wherein the nonmagnetic underlayer has a thickness ranging 0.5 μm to 7 μm, the soft magnetic underlayer has a thickness of 0.3 μm or greater, and a sum of the thickness of the nonmagnetic underlayer and the thickness of the soft magnetic underlayer is 3 μm or greater.

30. The method according to claim 26, further comprising the step of heating the substrate to a temperature of 300° C or less for 30 minutes or longer after forming the soft magnetic underlayer.

31. The method according to claim 28, further comprising the step of heating the substrate to a temperature of 300° C or less for 30 minutes or longer after forming the soft magnetic underlayer.

32. The method according to claim 28, further including the step of forming a soft magnetic supplement layer on the soft magnetic underlayer before forming the nonmagnetic seed layer, wherein the soft magnetic supplement layer has a film thickness of 50 nm or less, and a product of the film thickness and a saturation magnetic flux density is 150 G μm or larger.

33. The method according to claim 27, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.

34. The method according to claim 29, wherein the surface of the soft magnetic underlayer has a surface roughness Ra of 0.5 nm or less and a micro waviness Wa of 0.5 nm or less.